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IN THE U.S. PATENT AND TRADEMARK OFFICE



In re Application of: **Prichett**

Serial No.: **09/851,191**

Filed: **May 8, 2001**

Docket No.: **TI-31005**

Examiner: **S.C. Pathak**

Art Unit: **2634**

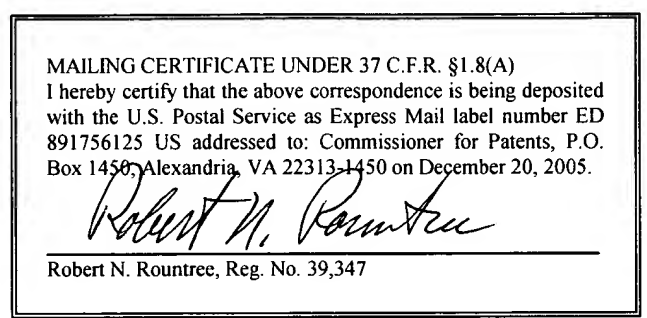
For: **IF-TO-BASEBAND CONVERSION FOR FLEXIBLE FREQUENCY PLANNING CAPABILITY**

**APPEAL BRIEF TRANSMITTAL FORM**

December 20, 2005

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:



Transmitted herewith in triplicate is Appellants' Brief in the above-identified application.

Charge the fee under 37 C.F.R. § 1.17(c) and any additional fees, or credit overpayment to the deposit account of Texas Instruments Incorporated, Account No. 20-0668. An original and two copies of this sheet are enclosed.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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For: **IF-TO-BASEBAND CONVERSION FOR FLEXIBLE FREQUENCY PLANNING  
CAPABILITY**

**APPELLANTS' BRIEF**

December 20, 2005

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

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*Robert N. Rountree*

Robert N. Rountree, Reg. No. 39,347

Dear Sir:

In support of their appeal of the Final Rejection of claims in the above-referenced application, Appellants respectfully submit herein their brief.

**1. REAL PARTY IN INTEREST**

Texas Instruments Incorporated is the real party in interest.

**2. RELATED APPEALS AND INTERFERENCES**

No other related appeals or interferences are known to Appellants.

### **3. STATUS OF CLAIMS**

Claims 1-19 are in the application. Claims 20-21 are cancelled without prejudice. Claims 1-19 are rejected under 35 U.S.C. § 103(a). Examiner in an Office Action of June 28, 2005 made final rejection of claims 1-19. Examiner reaffirmed the June 28, 2005 rejection in an Advisory Action dated September 21, 2005. Claims 1-19 are on appeal and are reproduced in the Appendix to Appellants' Brief filed herewith.

### **4. STATUS OF AMENDMENTS**

No amendment was filed subsequent to final rejection.

### **5. SUMMARY OF CLAIMED SUBJECT MATTER**

Independent claim 1 is directed to an RF receiver apparatus as in Figure 3. The receiver includes mixing circuitry (33) formed on a first integrated circuit (31) for mixing an analog RF signal (RF) down to an analog IF signal (37). (page 6, lines 11-13). An analog IF-to-digital baseband converter (34) is formed on the first integrated circuit (31) and coupled to the mixer for converting the analog IF signal into a digital baseband signal. An output (38) coupled to the analog IF-to-digital baseband converter transmits the digital baseband signal. (page 6, lines 7-8).

Independent claim 9 is directed to a baseband processor apparatus as in Figure 3. The baseband processor includes an input (38) for receiving a digital baseband signal from an RF receiver apparatus (31). The RF receiver apparatus (31) includes mixing circuitry (33) formed on a first integrated circuit (31) for mixing an analog RF signal down to an analog IF signal (37) and an analog IF-to-digital baseband converter (34) formed on the first integrated circuit (31) and coupled to receive the analog IF signal. (page 6, lines 11-13). A digital communication processing portion (36) is coupled to the input for performing a digital processing operation on said digital baseband signal. (page 6, lines 8-11).

Independent claim 13 is directed to a communication receiver as in Figure 3. The receiver includes an RF receiver apparatus (31) having mixing circuitry (33) for mixing an analog RF signal down to an analog IF signal and an analog IF-to-digital baseband converter (34) coupled to said mixer for converting said analog IF signal into a digital baseband signal. (page 6, lines 11-13). An output (38) coupled to the analog IF-to-digital baseband converter outputs the digital baseband signal. The RF receiver apparatus is formed on a first integrated circuit (31). A baseband processor apparatus (36) has an input (38) coupled to the output (38) of the RF receiver apparatus (31) for receiving the digital baseband signal from said RF receiver apparatus. A digital communication processor (36) coupled to the input (38) performs a digital processing operation on the digital baseband signal. (page 6, lines 8-11).

Independent claim 18 is directed to a method of using an RF receiver apparatus as in Figures 3-4 and 6. The RF receiver apparatus is formed on an integrated circuit (31). The RF receiver apparatus mixes (33) an analog RF signal down to an analog IF signal (37) within the RF receiver apparatus. An A/D converter (42) converts the analog IF signal into a digital IF signal (49) (step 61 of Figure 6). (page 6, lines 17-20). A digital IF-to-baseband converter (44) receives the digital IF signal and produces a signal (40) within the RF receiver apparatus. The digital baseband signal (40) is transmitted to a matched filter (45). (page 6, lines 20-21).

## **6. GROUNDS FOR REJECTION TO BE REVIEWED ON APPEAL**

Claims 1-5, 7, 9, and 12-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Appellants' admitted prior art in view of Tröster et al., An Interpolative Bandpass Converter on a 1.2- $\mu$ m BiCMOS Analog/Digital Array, VOL. 28, NO. 4, 471-477 (April 1993).

## 7. ARGUMENT

Independent claim 1 recites “An RF receiver apparatus, comprising: mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal; an analog IF-to-digital baseband converter formed on said first integrated circuit and coupled to said mixer for converting said analog IF signal into a digital baseband signal; and an output coupled to said analog IF-to-digital baseband converter for transmitting said digital baseband signal.”

Independent claim 9 recites “A baseband processor apparatus, comprising: an input for receiving a digital baseband signal from an RF receiver apparatus, said RF receiver apparatus comprising mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal and an analog IF-to-digital baseband converter formed on the first integrated circuit and coupled to receive said analog IF signal; and a digital communication processing portion coupled to said input for performing a digital processing operation on said digital baseband signal.”

Independent claim 13 recites “A communication receiver, comprising: an RF receiver apparatus including mixing circuitry for mixing an analog RF signal down to an analog IF signal, an analog IF-to-digital baseband converter coupled to said mixer for converting said analog IF signal into a digital baseband signal, and an output coupled to said analog IF-to-digital baseband converter for outputting said digital baseband signal, said RF receiver apparatus formed on a first integrated circuit; and a baseband processor apparatus having an input coupled to said output of said RF receiver apparatus for receiving said digital baseband signal from said RF receiver apparatus, and a digital communication processor coupled to said input for performing a digital processing operation on said digital baseband signal.”

Independent claim 18 recites “A method of using an RF receiver apparatus formed on an integrated circuit, comprising: mixing an analog RF signal down to an analog IF signal within the

RF receiver apparatus; converting the analog IF signal into a digital baseband signal within the RF receiver apparatus; and transmitting the digital baseband signal.”

Regarding independent claims 1, 9, 13, and 18 and their respective dependent claims, the primary issues are 1) whether Appellants’ admitted prior art and Tröster et al., An Interpolative Bandpass Converter on a 1.2- $\mu$ m BiCMOS Analog/Digital Array, VOL. 28, NO. 4, 471-477 (April 1993) are properly combinable and 2) if combined, whether they teach or suggest all the limitations of claims 1, 9, 13, and 18.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. (MPEP § 2143). Appellants respectfully submit that examiner has failed to meet these criteria. Moreover, the examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the Examiner does not produce a *prima facie* case, the Appellants are under no obligation to submit evidence of nonobviousness. “To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.” *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). (MPEP § 2142). Examiner has failed to establish a *prima facie* case of obviousness for the following reasons.

#### 1. SUGGESTION OR MOTIVATION TO COMBINE REFERENCES

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or

motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. (MPEP § 2143.01).

Tröster et al. disclose at Figure 6 (page 475) a circuit that is equivalent to baseband processor 13 of Figure 1 of Appellants' admitted prior art. At Figure 1 of the instant specification baseband processor 13 receives a digital IF signal 19 and produces a digital baseband signal 18. (page 2, lines 3-7). Likewise, Tröster et al. disclose in their Floorplan diagram of Figure 6 intermediate frequency input signal  $X_{IF}(t)$  and baseband output signals  $I_{k1}$  and  $Q_{k1}$ . Furthermore, Tröster et al. state "Now the monolithic integration of the complete signal path from the IF signal range to the digital baseband processing is feasible." (Conclusion). Therefore, one of ordinary skill in the art would not think to combine Appellants' admitted prior art with the disclosure of Tröster et al. They are the same. Thus, Appellants respectfully submit that claims 1, 9, 13, and 18 and their respective depending claims are patentable under 35 U.S.C. § 103(a).

## 2. REASONABLE EXPECTATION OF SUCCESS

A *prima facie* obviousness case requires a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Here, a combination of Appellants' admitted prior art and Tröster et al. offers no chance of success. Tröster et al. disclose an IF-to-baseband conversion circuit at Figure 6, page 475. This IF-to-baseband conversion circuit is equivalent to the IF-to-baseband conversion circuit 13 at Figure 1 of Appellants' admitted prior art. A combination of Tröster et al. with Appellants' admitted prior art, therefore, would not produce "mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal" and "an analog IF-to-digital baseband converter formed on said first integrated circuit and coupled to said mixer for converting said analog IF signal into a digital baseband signal" as required by claim 1. Independent claims 9, 13, and 18 include substantially these same limitations. Thus, Appellants respectfully submit that claims 1, 9, 13, and 18 and their respective depending claims are patentable under 35 U.S.C. § 103(a).

### 3. ALL CLAIM LIMITATIONS

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). “All words in a claim must be considered in judging the patentability of that claim against the prior art.” *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. § 103(a), then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). (MPEP § 2143.03). At least the following emphasized limitations are not disclosed by a combination of Appellants’ admitted prior art with Tröster et al.

Regarding independent claim 1, neither Appellants’ admitted prior art nor Tröster et al. disclose “An RF receiver apparatus, comprising: **mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal; an analog IF-to-digital baseband converter formed on said first integrated circuit and coupled to said mixer for converting said analog IF signal into a digital baseband signal; and an output coupled to said analog IF-to-digital baseband converter for transmitting said digital baseband signal.**”

Regarding independent claim 9, neither Appellants’ admitted prior art nor Tröster et al. disclose “A baseband processor apparatus, comprising: an input for receiving a digital baseband signal from an RF receiver apparatus, said **RF receiver apparatus comprising mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal and an analog IF-to-digital baseband converter formed on the first integrated circuit and coupled to receive said analog IF signal;** and a digital communication processing portion coupled to said input for performing a digital processing operation on said digital baseband signal.”

Regarding independent claim 13, neither Appellants’ admitted prior art nor Tröster et al. disclose “A communication receiver, comprising: **an RF receiver apparatus including mixing circuitry for mixing an analog RF signal down to an analog IF signal, an analog IF-to-**



**digital baseband converter coupled to said mixer for converting said analog IF signal into a digital baseband signal**, and an output coupled to said analog IF-to-digital baseband converter for outputting said digital baseband signal, **said RF receiver apparatus formed on a first integrated circuit**; and a baseband processor apparatus having an input coupled to said output of said RF receiver apparatus for receiving said digital baseband signal from said RF receiver apparatus, and a digital communication processor coupled to said input for performing a digital processing operation on said digital baseband signal.”

Regarding independent claim 18, neither Appellants’ admitted prior art nor Tröster et al. disclose “A method of using **an RF receiver apparatus formed on an integrated circuit**, comprising: mixing **an analog RF signal down to an analog IF signal within the RF receiver apparatus**; converting the analog IF signal into a digital baseband signal within the RF receiver apparatus; and transmitting the digital baseband signal.”

In an Advisory Action dated September 21, 2005, Examiner Pathak admitted Appellants’ admitted prior art “does not disclose mixing circuitry and the analog IF-to-digital baseband converter circuitry (as disclosed in the AAPA described above) to be implemented on the same integrated circuit.” Examiner Pathak further stated “This specific limitation is disclosed in the Troster reference.” (page 3, paragraph 4). As previously stated, claim 1 specifically recites “An RF receiver apparatus, comprising: **mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal**; an analog IF-to-digital baseband converter formed on said first integrated circuit and coupled to said mixer for converting said analog IF signal into a digital baseband signal.” (emphasis added). Examiner Pathak **does not** contend that Tröster et al. disclose mixing circuitry “for mixing an analog RF signal down to an analog IF signal” on the same integrated circuit as the analog IF-to-digital baseband converter. He simply ignores this limitation in each independent claim.

In view of the above, Appellants respectfully request favorable consideration of the appeal from Final Rejection in the above referenced application, its reversal, and allowance of claims 1-19.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Robert N. Rountree". The signature is fluid and cursive, with the first name "Robert" being more prominent.

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## **8. APPENDIX**

### **CLAIMS ON APPEAL**

1. An RF receiver apparatus, comprising:  
mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal;  
an analog IF-to-digital baseband converter formed on said first integrated circuit and coupled to said mixer for converting said analog IF signal into a digital baseband signal; and  
an output coupled to said analog IF-to-digital baseband converter for transmitting said digital baseband signal.
2. The apparatus of Claim 1, comprising a baseband processing apparatus formed on a second integrated circuit and coupled to said output.
3. The apparatus of Claim 1, wherein said analog IF-to-digital baseband converter includes an A/D converter for digitizing said analog IF signal to produce a digital IF signal, and a digital IF-to-baseband converter coupled to said A/D converter for converting said digital IF signal into a further digital baseband signal.
4. The apparatus of Claim 3, where said analog IF-to-digital baseband converter includes a filter coupled to said digital IF-to-baseband converter for filtering said further digital baseband signal to produce said first-mentioned digital baseband signal.
5. The apparatus of Claim 4, wherein said filter includes a decimator.
6. The apparatus of Claim 4, wherein said filter includes a quantizer.
7. The apparatus of Claim 3, wherein said digital IF-to-baseband converter includes a CORDIC circuit.

8. The apparatus of Claim 1, wherein said analog IF-to-digital baseband converter produces said digital baseband signal in parallel format, and including a parallel-to-serial converter connected between said analog IF-to-digital baseband converter and said output, said parallel-to-serial converter providing a serial formatted digital baseband signal to said output.

9. A baseband processor apparatus, comprising:

an input for receiving a digital baseband signal from an RF receiver apparatus, said RF receiver apparatus comprising mixing circuitry formed on a first integrated circuit for mixing an analog RF signal down to an analog IF signal and an analog IF-to-digital baseband converter formed on the first integrated circuit and coupled to receive said analog IF signal; and

a digital communication processing portion coupled to said input for performing a digital processing operation on said digital baseband signal.

10. The apparatus of Claim 9, wherein said input is for receiving said digital baseband signal in serial format, and including a serial-to-parallel converter connected between said input and said digital communication processing portion for converting said digital baseband signal from serial format to parallel format and providing said parallel formatted digital baseband signal to said digital communication processing portion.

11. The apparatus of Claim 10, wherein said serial-to-parallel converter includes an input for receiving a clock signal from the RF receiver apparatus.

12. The apparatus of Claim 9, formed on a second integrated circuit.

13. A communication receiver, comprising:

an RF receiver apparatus including mixing circuitry for mixing an analog RF signal down to an analog IF signal, an analog IF-to-digital baseband converter coupled to said mixer for converting said analog IF signal into a digital baseband signal, and an output coupled to said analog IF-to-digital baseband converter for outputting said digital baseband signal, said RF receiver apparatus formed on a first integrated circuit; and

a baseband processor apparatus having an input coupled to said output of said RF receiver apparatus for receiving said digital baseband signal from said RF receiver apparatus, and a digital communication processor coupled to said input for performing a digital processing operation on said digital baseband signal.

14. The communication receiver of Claim 13, wherein said baseband processor apparatus is formed on a second integrated circuit.

15. The communication receiver of Claim 14, wherein said analog IF-to-digital baseband converter comprises a coordinate rotation digital computer.

16. The communication receiver of Claim 14, wherein said baseband processor apparatus is a digital signal processor.

17. The communication receiver of Claim 13, wherein said RF receiver apparatus is provided as an integrated circuit.

18. A method of using an RF receiver apparatus formed on an integrated circuit, comprising:  
mixing an analog RF signal down to an analog IF signal within the RF receiver apparatus;  
converting the analog IF signal into a digital baseband signal within the RF receiver apparatus; and  
transmitting the digital baseband signal.

19. The method of Claim 18, wherein said transmitting step includes transmitting the digital baseband signal in serial format.

## 9. CITED CASES

- 1) *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).
- 2) *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).
- 3) *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).
- 4) *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).
- 5) *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

LEXSEE 227 USPQ 972

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UNITED STATES PATENTS QUARTERLY

Ex parte Clapp

No Number in Original

U.S. Patent and Trademark Office, Board of Patent Appeals and Interferences

227 U.S.P.Q. (BNA) 972

Opinion dated Feb. 28, 1985

**CASE HISTORY and DISPOSITION:** Application for patent of Thomas R. Clapp, Serial No. 257,162, filed Apr. 24, 1981. From rejection of Claim 9-19, applicant appeals (Appeal No. 553-54). Reversed.

**HEADNOTES:**  
PATENTS

[\*\*1H] 1. Anticipation -- Combining references (51.205)

To support conclusion that claimed combination is directed to obvious subject matter, references must either expressly or impliedly suggest claimed combination or examiner must present convincing line of reasoning as to why artisan would have found claimed invention to have been obvious in light of references' teachings.

**CLASS-NO:** 51.205

**COUNSEL:** Gomer W. Walters, for appellant.

**JUDGES:** Before Bennett, Henon and Spencer, Examiners-in-Chief.

**OPINIONBY:** Henon, Examiner-in-Chief.

**OPINION:**

This appeal is from the decision of the examiner rejecting claims 9 through 19, which constitute all the claims remaining in the application.

The invention relates to an auger type mixing apparatus for mixing cementitious materials employing a volatile liquid. Representative claim 9 reads as follows:

9. Apparatus mounted on a vehicle for mixing a cementitious material in which a volatile liquid is employed comprising:  
an enclosed mixing chamber sealed to prevent the escape of the volatile liquid and any potentially dangerous fumes;  
a solid frame forming the top of said mixing chamber and having an inlet end thereof pivotably mounted on the vehicle;

an easily removable elastomeric trough forming the bottom of said mixing chamber, the elastomeric material selected to be compatible with the materials being mixed;

an auger having a central shaft and mounted in said frame to convey materials through said mixing chamber;

mixing paddles mounted on the shaft of said auger;

a drive motor for said auger mounted on said frame;

a releasable flexible coupling between the aligned shafts of said motor and said auger to permit removal of said auger from said frame;

an inlet hopper to introduce substantially dry materials into said mixing chamber;

liquid injection means to introduce a liquid into said mixing chamber at a distance removed from said inlet hopper to have said substantially dry material form a plug to prevent the liquid and any fumes from backing up said inlet hopper; and

a discharge opening formed in said elastomeric trough.

The references relied on by the examiner are:

Clemens 2,159,205 May 23, 1939  
August 2,709,075 May 24, 1955  
Tiemersma 3,199,145 Aug. 10, 1965  
Cunningham 3,227,424 Jan. 4, 1966  
Zimmerman 3,310,293 Mar. 21, 1967  
Futty et al. (Futty) 3,339,898 Sep. 5, 1967  
Wilkinson et al. (Wilkinson) 3,348,820 Oct. 24, 1967  
Lasar 3,901,483 Aug. 26, 1975

Claims 9 through 14 and 17 stand rejected as being directed to obvious subject matter within the meaning of 35 U.S.C. 103 in light of the teachings of Zimmerman in view of Wilkinson, Futty, Lasar, Clemens and Cunningham. The examiner contends that Zimmerman discloses the claimed subject matter except for "having the mixing chamber enclosed with a solid top frame and having a removable auger and having liquid injection means and aligned shafts between the motor and auger and a discharge formed in the elastomeric trough," (final rejection, page 2, paper number 5). The examiner cites Wilkinson as disclosing an enclosed mixing chamber [\*973] where the enclosure comprises an inverted substantially U-shaped top frame portion and concludes that it therefore would be obvious to the artisan to modify the open frame in Zimmerman to be an enclosed mixing chamber as taught by Wilkinson "if desired." Since Wilkinson also discloses the concept of providing liquid injection means for the introduction of liquid into a mixing chamber remote from the inlet hopper, the examiner concludes that it would therefore be obvious to modify Zimmerman accordingly. Since Lasar discloses the concept of having an auger with mixing paddles mounted thereon wherein the auger is releasably coupled to a frame, the examiner concludes that it would have been obvious to the artisan to modify the auger in Zimmerman as taught by Lasar. Futty is cited to show that it is well known to provide coaxial alignment between an auger shaft and the shaft of a driving motor. Clemens is cited as disclosing the concept of having a discharge opening in a trough. The examiner concludes that it would have been obvious in light of Futty and Clemens to modify the auger motor alignment and discharge opening of Zimmerman to be of the nature suggested by Futty and Clemens. Cunningham is cited as disclosing seal means to preclude leakage of the material within the mixing chamber. The examiner concludes that it would have been obvious in light of the teachings of Cunningham to employ seal means on the modified device of Zimmerman.

Claim 15 stands rejected as being directed to obvious subject matter under 35 U.S.C. 103 in light of the combined teachings of Zimmerman, Wilkinson, Futty, Lasar, Clemens, Cunningham and August. Combining the teachings of Zimmerman, Wilkinson, Futty, Lasar, Clemens and Cunningham in the manner specified supra, the examiner concludes that it would have been further obvious to the artisan in light of the teachings of August to provide spray elements with selectively activated controls since August teaches such devices to be known.



Claims 16, 18 and 19 stand rejected as being directed to obvious subject matter under 35 U.S.C. 103 in light of the combined teachings of Zimmerman, Wilkinson, Fuddy, Lasar, Clemens, Cunningham and Tiemersma. Combining the teachings of Zimmerman, Wilkinson, Fuddy, Lasar, Clemens and Cunningham in the manner specified supra, the examiner concludes that it would have been obvious to further modify the structure of Zimmerman to include a gas-filled bearing housing for sealing purposes.

Rather than reiterate the arguments of appellant and the examiner, reference is made to the brief and answer for the respective details thereof.

Opinion We will not sustain any of the rejections.

Go to Headnotes [\*\*1R] [1] Presuming arguendo that the references show the elements or concepts urged by the examiner, the examiner has presented no line of reasoning, and we know of none, as to why the artisan viewing only the collective teachings of the references would have found it obvious to selectively pick and choose various elements and/or concepts from the several references relied on to arrive at the claimed invention. In the instant application, the examiner has done little more than cite references to show that one or more elements or subcombinations thereof, when each is viewed in a vacuum, is known. The claimed invention, however, is clearly directed to a combination of elements. That is to say, appellant does not claim that he has invented one or more new elements but has presented claims to a new combination of elements. To support the conclusion that the claimed combination is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed combination or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. We find nothing in the references that would expressly or impliedly teach or suggest the modifications urged by the examiner. Additionally, as aforementioned, we find no line of reasoning in the answer, and we know of none, as to why the artisan would have found the modifications urged by the examiner to have been obvious. Based upon the record before us, we are convinced that the artisan would not have found it obvious to selectively pick and choose elements or concepts from the various references so as to arrive at the claimed invention without using the claims as a guide. It is to be noted that simplicity and hindsight are not proper criteria for resolving the issue of obviousness. Note *In re Horn*, 203 USPQ 969, 971 (CCPA 1979). Accordingly, we will not sustain any of the rejections presented.

The decision of the examiner rejecting claims 9 through 19 as being directed to obvious subject matter within the meaning of 35 U.S.C. 103 is reversed.

LEXSEE 424 F.2D 1382

In re David W. Wilson

No. 8271

United States Court of Customs and Patent Appeals

57 C.C.P.A. 1029; 424 F.2d 1382; 1970 CCPA LEXIS 378; 165 U.S.P.Q. (BNA)  
494

Oral argument February 4, 1970

May 7, 1970

**PRIOR HISTORY:** [\*\*\*1]

APPEALS from Patent Office, Serial No. 332,321

**DISPOSITION:**

Reversed.

**LexisNexis(R) Headnotes**

**COUNSEL:**

*Oberlin, Maky, Donnelly & Renner, William E. Thomson, Jr., John C. Oberlin*, attorneys of record, for appellant.

*Joseph Schimmel* for the Commissioner of Patents.  
*Raymond E. Martin*, of counsel.

**OPINIONBY:**

LANE

**OPINION:** [\*\*1382]

[\*1029] Before RICH, ALMOND, BALDWIN, LANE, Associate Judges, and FORD, Judge, sitting by designation.

LANE, Judge, delivered the opinion of the court.

This appeal is from the decision of the Patent Office Board of Appeals, which affirmed the rejection of claims 1-4, 8-10, and 15-21 in appellant's application serial No. 332,321, filed November 5, 1963, for "Treated Brush and Brush Treating Composition." Four other claims have been allowed. We conclude that the board's decision must be reversed.

**The Disclosure**

Appellant's disclosure discusses certain problems in the treatment of power-driven rotary brushes. According to the disclosure, it was desirable to produce [\*\*1383] a composition for treating the brush bristles, whereby the ability of the bristles to hold abrasive particles would be enhanced. It discloses that the treatment composition should have a [\*\*\*2] strength of adhesion to the brush bristles sufficiently great to prevent such composition from transferring excessively to the object being brushed; that the treatment material should wear at substantially the same rate as the brush bristles; that the material should have a high temperature softening point; and that the strength of adhesion between the treating composition and the abrasive particles must be sufficient to withstand the centrifugal force which normally would tend to throw the abrasive outwardly from the brush. The disclosure [\*1030] states that previously known brush-treating compositions did not accomplish all these objectives and

57 C.C.P.A. 1029, \*, 424 F.2d 1382, \*\*;  
1970 CCPA LEXIS 378, \*\*\*, 165 U.S.P.Q. (BNA) 494

had a tendency to dry and lose their tackiness over a period of time, thus becoming useless for holding abrasive particles on the bristles.

The disclosure states that appellant discovered that a composition having a high temperature softening point and a high degree of tackiness could be produced if a film-forming resin were blended with a tackifier resin which was incompatible with (insoluble in) the film-forming resin. The resulting composition would have two distinct phases: a continuous phase comprised of film-forming resin, [\*\*\*3] either alone or saturated with a small quantity of tackifier resin, and a dispersed phase comprised of small particles of tackifier resin. The two resins may be either completely or partially incompatible, and the disclosure states that the more insoluble the resins, the greater the tack which the composition possesses. Appellant also disclosed that certain plasticizer could be added to render the resins more incompatible, thus further increasing the tack of the composition. Finally, appellant stated that the entire composition could be dissolved in a volatile solvent to allow easy application to the brush, the solvent being one which quickly evaporates upon such application.

The specification contains a list of suitable film-forming resins, including ethyl cellulose, nitro cellulose, cellulose acetate, polyvinyl acetate and cis-polyisoprene, among other materials. A list of tackifiers is given, including certain esters of abietic acid, polyvinyl ethyl ether, coumarone indene resin and terpene resins. A list of plasticizers is also given. The specification then gives four examples showing how to combine various film-formers, tackifiers, plasticizers and solvents to obtain [\*\*\*4] brush-treating compositions of the desired characteristics, and explains how to apply them to brushes.

#### The Claims

In view of the result we reach, we find that claims 1 and 8 are representative:

1. A two-phase brush treating composition having a high softening point and sufficient tack to retain abrasive material firmly adhered to brush fill material comprising a film-forming resin and a tackifier resin which is incompatible with said film-forming resin, said two phases comprising a continuous phase formed of said film-forming resin and a dispersed phase formed of small particles of tackifier resin.

8. In combination, a rotary brush having brush fill material and a two-phase pressure sensitive adhesive brush treating composition adhered thereto having a high softening point and sufficient tack to retain abrasive material firmly adhered to such brush fill material comprising a film-forming resin and a tackifier resin

which is incompatible with said film-forming resin, said two phases [\*1031] comprising a continuous phase formed of said film-forming resin and a dispersed phase formed of small particles of tackifier resin. [\*\*1384]

The remaining claims on appeal [\*\*\*5] are narrower, containing recitations of specific resins, plasticizers, etc.

#### The Prior Art

Grantham n1 relates to coatings for film material and discloses a coating composition comprising a cellulose derivative film-former, a blending resin, a plasticizer, and an organic solvent. Grantham teaches that the blending agent and the film-former should be compatible.

n1 U.S. Pat. 3,051,670, issued August 28, 1962.

Depew n2 teaches the preparation of emulsions consisting of a continuous phase of water and a discontinuous phase of elastomer particles and particles of a volatile hydrocarbon, with vulcanizing ingredients and other additives dispersed in the hydrocarbon particles. Depew then states that where a dispersion with additional adhesive properties is desired, an adhesive, such as certain of the tackifier resins disclosed by appellants, can be added to the emulsion, and that

n2 U.S. Pat. 2,933,469, issued April 19, 1960.

[this] adhesive can be water soluble or dispersed as particles. \* \* \* The chemistry of the adhesive component is not critical to this invention. The important thing is that the deposited film shall be tacky and adhesive.

Sergi n3 relates [\*\*\*6] to adhesives suitable for installation of floor-covering products such as linoleum. Sergi's composition consists of a tackifier resin dispersed in a latex binder; the tackifier and latex must be compatible with one another, according to the Sergi disclosure.

n3 U.S. Pat. 3,015,638, issued January 2, 1962.

Vaughan n4 teaches impregnating a fibrous buffing wheel with an aqueous emulsion consisting of a tacky resin and an emulsifier or stabilizer such as glue or gum.

n4 U.S. Pat 2,890,136, issued June 9, 1959.

#### The Board

57 C.C.P.A. 1029, \*, 424 F.2d 1382, \*\*;  
1970 CCPA LEXIS 378, \*\*\*, 165 U.S.P.Q. (BNA) 494

The board found the composition claims to be unpatentable over Depew, Sergi or Grantham under 35 U.S.C. 103. The board reached this conclusion after noting that each of the three references shows some of the film-formers, tackifiers, plasticizers and solvents appearing in appellant's lists. The board found that the recited limitation of incompatibility was too relative a term to distinguish over the composition of the references.

The board found that the claims to the treated brush were unpatentable, under 35 U.S.C. 103, over Vaughan in view of Sergi or Depew. Since Vaughan shows treating brushes, the board apparently considered [\*1032] [\*\*\*7] it obvious to treat brushes with composition which it thought were made obviously by Sergi or Depew.

The Board also affirmed the rejection of certain claims for being "broader than the disclosure" under 35 U.S.C. 112. The board's basis for this rejection was that the specification did not provide adequate guidelines for making a selection among the various disclosed ingredients, nor among other materials which are not disclosed but would be included by the claims.

#### Opinion

We first treat the rejection under section 112. This rejection is in effect an attack on the specification as being insufficient to teach how to practice the broad invention claimed. The rejection is therefore under the first paragraph of section 112. The board's position, as mentioned above, was that the specification did not teach how to select ingredients so that the desired incompatibility would result. We disagree with the board's position on this point. First of all, appellant provided four examples, each specifying the nature and amounts of materials to be used. Secondly, the record indicates that it involves only routine experimentation to find out which resins are incompatible. The examiner admitted [\*\*\*8] as much when, [\*\*1385] with regard to obviousness, he said "selecting the proper tackifier and film-forming resin from those listed in the references to form an emulsion or two-phase composition would be within the expected skill of the art and would merely involve routine experimentation." We conclude that appellant has provided a sufficient specification to support the claims here in issue.

[1] Turning to the rejection of the claims for obviousness, we again disagree with the board's position. The board has disregarded the term "incompatible," and used in the claims, because it is "too relative" to distinguish over the compositions of the references. Appellant contends this limitation is essential in defining his invention. There has been no rejection here for indefiniteness, under the second paragraph of section 112. Rather than reject the claims as indefinite, the board chose to ignore the language it considered indefinite, and proceeded as though that language were not in the claims. The board said, in effect, that since we do not know what "incompatible" means, and the rest of the claim defines obvious subject matter, there is no basis for concluding unobviousness. [\*\*\*9] This reasoning is incorrect. All words in a claim must be considered in judging the patentability of that claim against the prior art. If no reasonably definite meaning can be ascribed to certain terms in the claim, the subject matter does not become obvious - the claim becomes indefinite. In the present case, we think the [\*1033] term "incompatible" is defined with reasonable definiteness in the specification. While it is true that the word is not perfectly precise, under the circumstances of the present case there appears to be no other way for appellant to describe his discovery. In any event, the ignoring of this term by the board renders its conclusion of obviousness unsupported. None of the references discloses a two-phase composition of incompatible resins or suggests that such a composition would have the properties disclosed by appellant. Grantham and Sergi both expressly teach that the components of their compositions should be compatible. Neither Vaughan nor Depew uses a resin as the continuous phase. While Depew states, as quoted above, that the adhesive material may be dispersed as particles in the continuous phase, and hence be incompatible with the continuous [\*\*\*10] phase material, it cannot be ignored that Depew's continuous phase is of water, not a film-forming resin as recited in appellant's claims. Furthermore, there is no suggestion in Depew or Vaughan that there are advantages in using an adhesive which is insoluble in the aqueous phase. There is nothing of record, therefore, from which we can properly conclude that the subject matter of appellant's claims would have been obvious at the time of his invention. The decision of the board must accordingly be reversed.

LEXSEE 490 F.2D 981

**IN THE MATTER OF THE APPLICATION OF STEPHEN F. ROYKA AND  
ROBERT G. MARTIN**

**Patent Appeal No. 9092**

**UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS**

**490 F.2d 981; 1974 CCPA LEXIS 200; 180 U.S.P.Q. (BNA) 580**

**February 7, 1974, Decided.**

**PRIOR HISTORY:** **[\*\*1]** Serial No. 648,701.

**LexisNexis(R) Headnotes**

**OPINIONBY:**

RICH

**OPINION:** **[\*981]**

RICH, Judge.

This appeal is from the decision of the Patent Office Board of Appeals affirming the examiner's rejection of claims 28 and 30-36 of application serial No. 648,701, filed June 26, 1967, entitled "Responsive Answer System." We reverse.

**The Invention**

The appealed claims are directed to a device in the nature of an answer sheet for use in self-instruction and testing. The answer sheet may be associated with questions or separate therefrom. The essential features of the invention are that there are printed on the answer sheet in "response areas" meaningful information in permanent printing and confusing information in printing which can be removed, as by an eraser, both being legible so that a student, seeing a choice of answers to a question, must make a selection. Having made a selection, he then applies an eraser to the selected response area and some of the information will be readily removed. What remains

advises him of the correctness or otherwise of his answer. The following figures from the drawings are illustrative:

[Graphic omitted. See illustration in original.]

Fig. 1A shows two response areas **[\*\*2]** to a given question before any removing action **[\*982]** by the student has taken place and Fig. 1B shows the permanent information remaining in each after erasure of the removable information. Of course, if the student makes an initial choice of area A, showing up "YES" or some other indication of a correct answer, he will not need to proceed further and erase the B area. In a modified form of the invention, a wrong selection, plus erasure, may expose, instead of or in addition to a statement that the answer is wrong, a number or other reference to further material which is to be studied.

A preferred method of printing the permanent meaningful information and the removable confusing information is by that type of xerography in which a fusible toner is used, the permanence of the printing depending on the extent to which the toner image is "fixed" or fused by heat. By successive printings of the two kinds of information with fixing to different degrees, one image can be made permanent and the other made subject to easy removal, both images retaining such similarity of appearance that the user of the answer sheet cannot tell them apart.

Claim 28 is the principal claim, all **[\*\*3]** others being dependent thereon, and reads as follows:

28. A device for selectively indicating information comprising

a support having response areas for presenting information for selection,

permanent printing indicative of meaningful information permanently fixed to said support within a response area, and

removable printing indicative of confusing information removably fixed to said support within a response area,

said meaningful and confusing information being substantially legible even when said permanent and removable printing are fixed over one another on said support,

said permanent and removable printing being substantially similar such that an observer cannot determine which information is permanent and which is removable

whereby the information within a response area is selected by attempting to remove the printing therein with the failure to remove printing identifying meaningful information.

Claims 30-36 add limitations which need not be considered except for noting that claims 33 and 34 alone specify the use of a xerographic toner, for which reason they were rejected on a different ground from the other claims.

#### The Rejection

The following references [\*\*4] were relied on:

[SEE TABLE IN ORIGINAL]

Claims 28, 30, 31, and 32 were rejected as anticipated under 35 USC 102 by Bernstein; claims 28, 31, 32, 35, and 36 were rejected as anticipated under § 102 by Reid; and claims 33 and 34 were rejected under 35 USC 103 for obviousness, on either Bernstein or Reid in view of Lein. These were the examiner's rejections and the board affirmed them, adhering to its decision on reconsideration.

Bernstein discloses an answer sheet in which printed information representing a response is "temporarily concealed from the observer" and he discloses a number of different ways of effectively concealing the response. His specification states:

The objects of the invention are accomplished by utilizing the hiding media to confuse the participant and to render the response and the hiding media indistinguishable and thus conceal the presence, absence, nature or position of the response from the participant.

This may be effectuated by careful attention being paid to a number of factors including the design, [\*983] color and position of the hiding or confusing media.

Fig. 1 of Bernstein's drawings illustrates some of his concealing means: [\*\*5]

[Graphic omitted. See illustration in original.]

The following is the written description:

Referring now to the drawing, FIG. 1 illustrates some of the many optically confusing patterns which may be positioned between the printed structure to be concealed and the point of observation. Column 11 shows the information which is to be concealed. This information is repeated in columns 12 through 16 but in each case is concealed by a pattern in accordance with the present invention. Column 12 utilizes a pattern comprising an alphabetical maze in both line and half tone screen. Column 13 utilizes a pattern comprising an absorbing field having a plurality of irregular dot-like interstices. Column 14 utilizes a pattern comprising a maze of plus signs combined with dots. Columns 15 and 16 illustrate irregular and non-repetitious patterns. Bernstein says that if at least 50% of the response is actually covered by the opaque portions of the confusion pattern, complete concealment is obtained. He also says that added means of concealment may be used, such as scoring and embossing and perforating the paper in order to scatter the light or let it shine through.

Reid is entitled [\*\*6] "Transformation Picture and Print." The invention is said to be useful for advertisements, Christmas cards, birthday cards, valentines, and the like and as a source of amusement and instruction for children. It consists of a picture or print, part of which is permanently printed and part of which is removable from the paper on which it is printed. For the latter various soluble undercoatings or inks are described. If the picture is washed with a solvent, which may be water, the removable part disappears and the pictorial and/or typographic matter changes. The invention is illustrated by a typical nineteenth century temperance propaganda piece depicting the evils of drink. In the finished picture there are three scenes from left to right: Scene 1, the innocent child leads her father home from the pub; Scene 2, Father sits slumped in the kitchen chair with his bottle beside him, the family wash hanging above his head, this picture being entitled "The Effects of Drink"; Scene 3, Mother stands in front of a sign reading "Pawn Shop." Across the bottom of the picture is a legend which says "Wash the above and see what water will do." Fig. II shows the result of washing with water: Scene [\*\*7] 1, a handsome young man and his happy daughter stroll on the street; Scene 2, Father sits erect in a well-appointed room at a cloth-covered table, apparently having a cup of tea, obviously a gentleman; Scene 3, Mother beams from the

sideline and the Pawn Shop sign has vanished. Two new subscriptions appear and the words "The" and "Drink" have disappeared, the resultant being a new picture title reading "The Beneficial Effects of Temperance." "The Beneficial" and "Temperance" were covered by some soluble opaque in the original picture. No doubt the overall effect is instruction. Perhaps there was amusement in bringing about the transformation.

Lein relates to xerography and is relied on only for its disclosure of the removability of partially fused toner and the permanence of fully fused toner.

#### OPINION

As to the § 102 anticipation rejections, it will suffice to consider independent claim 28. If it is not fully met by Reid [\*984] or Bernstein, neither are the more limited dependent claims. It is elementary that to support an anticipation rejection, all elements of the claim must be found in the reference. We do not find claim 28 anticipated by Bernstein because, as [\*\*8] we read the claim, it requires the display of legible meaningful and legible confusing information simultaneously, between which the user of the device may make a selection before he undertakes to remove any of the information from the response area selected by him. The element we find most clearly missing, contrary to the reasoning of the examiner and the board, is the legible confusing information. The Patent Office proposes to read this limitation on Bernstein's confusion patterns which are nothing but meaningless obscuring screens, conveying no information and providing the user with no basis for making a selection, as called for by claim 28. In appellants' device the legible confusing information - i.e., the wrong answers - are legible in the sense that they can be read as intelligible words, not merely a jumble of type serving to obscure the words of the wrong answers.

Appellants were fully aware of Bernstein and discussed its disclosures in their specification, distinguishing from this and other prior art, saying, in part:

The inventive concept hereof confuses not by physical blocking as taught by the prior art, but by compounding, associating (including disarranging) [\*\*9] permanent information with confusing information, usually at least some of which is similar in character to the permanent information as to render it impossible to tell which is permanent and which is removable confusing information. In the invention, generally no attempt is made to designedly physically cover the permanent information, but to confuse it beyond interpretation by the presentation of extraneous removable, confusing information.

Claims are not to be read in a vacuum and while it is true they are to be given the broadest reasonable interpretation during prosecution, their terms still have to be given the meaning called for by the specification of which they form a part. We cannot read the terms "legible" and "information" on Bernstein's confusion patterns, as did the examiner and the board. They are not "legible," as appellants use the term, and they convey no information.

As to anticipation by Reid, we find neither appellants' basic concept nor the substance of claim 28 to be disclosed. Apparently the solicitor could find little to support the rejection in Reid for all he says in his brief - so far as claim 28 is concerned - is:

Reid discloses a sheet which may [\*\*10] be used for instruction and which may have a removable design partly covering a fixed design \* \* \*. Therefore, the disclosure of the reference encompasses the arrangement wherein a removable design covers a fixed design with both designs being substantially legible.

But claim 28 does not call for an arrangement wherein a removable design covers a fixed design. It calls for response areas, which Reid does not have, containing meaningful information in permanent printing together with removable printing conveying confusing information, both legible at the same time, between which a "selection" can be made. The only choice offered to the user by Reid is to follow the instruction to wash the whole visible picture with water or other solvent, thus removing the over-printing, to discover what the permanent picture is. The Patent Office attempt to read claim 28 on this reference is a tour de force. We hold that Reid does not anticipate for failure to meet the limitations of claim 28 to "response areas," to the presentation of two categories of information (meaningful-permanent and removable-confusing) within such areas, and the possibility of selection. Anticipation requires a finding [\*\*11] that the claimed invention be disclosed. It is not enough to say that appellants' invention and the reference are [\*985] both usable for instruction and both consist of permanent and removable printings on paper, as did the solicitor.

The dependent claims rejected with claim 28, as anticipated under § 102, are not anticipated since claim 28 is not anticipated. Some of them merely add features which are disclosed by the references and some do not. Insofar as they do not, they further negative anticipation. The examiner recognized this fact as to claims 33 and 34, which are limited to xerography, and therefore did not reject them under § 102. Similarly, he did not reject claim 30 on Reid or claims 35 and 36 on Bernstein. We find that claims 35 and 36 contain limitations which additionally distinguish from Reid. We

have already noted that Reid has no "response areas" as required by claim 28 and so Reid does not disclose the structure of claim 35 which additionally requires both the correct and incorrect answers to appear within the same response area.

As to claim 36, the examiner said it "is merely a printed matter variation of the design of the reference," Reid. This [\*\*12] is not a valid reason for rejection. Printed matter may very well constitute structural limitations upon which patentability can be predicated. We have commented on this matter in *In re Jones*, 54 CCPA 1218, 373 F.2d 1007, 153 USPQ 77 (1967); and *In re Miller*, 57 CCPA 809, 418 F.2d 1392, 164 USPQ 46 (1969), and will not repeat ourselves. The limitations of claim 36 are not remotely suggested by Reid.

There remains the § 103 rejection of claims 33 and 34. Do they, taken together with all of the limitations of claim 28 from which they depend, define obvious subject

matter? The difference between claim 28 and these two dependent claims is that they add the limitations to xerography. If Bernstein and Reid showed the claimed invention except for xerography, the addition of the Lein reference would make the subject matter of the claims obvious. But that is not the situation here. Adding the knowledge of xerographic technology to Bernstein or Reid still does not make the invention of claims 33 and 34 obvious for the same reasons we have given above in discussing anticipation. The essence of appellants' invention, as set forth in claim 28, is still missing notwithstanding the addition [\*\*13] of the Lein reference and we see nothing in the combinations of references which would have made the invention obvious to one of ordinary skill in the art at the time it was made. We will, therefore, reverse this rejection.

The decision of the board is reversed.

REVERSED



LEXSEE 800 F.2D 1091

In re MERCK & CO., INC.

No. 85-2740

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

800 F.2d 1091; 1986 U.S. App. LEXIS 20333; 231 U.S.P.Q. (BNA) 375

September 8, 1986

**PRIOR HISTORY:** [\*\*1]

Appealed from: U.S. Patent and Trademark Office Board of Patent Appeals and Interferences.

**DISPOSITION:**

AFFIRMED.

**LexisNexis(R) Headnotes**

**COUNSEL:**

Charles M. Caruso, of Merck & Co., Inc., Rahway, New Jersey, Argued for Appellant. With him on the brief was Nels T. Lippert, of Fitzpatrick, Cella, Harper & Scinto, New York, New York. Of Counsel were Mario A. Monaco and Michael C. Sudol, Jr., of Merck & Co., Inc., Rahway, New Jersey.

Richard E. Schafer, Associate Solicitor, Office of the Solicitor, Arlington, Virginia, argued for Appellee. With him on the brief were Joseph F. Nakamura, Solicitor, and Fred E. McKelvey, Deputy Solicitor.

Donald R. Dunner, of Finnegan, Henderson, Farabow, Garrett & Dunner, Washington, District of Columbia, argued for Intervenor Biocraft Laboratories, Inc. With him on the brief was Robert D. Bajefsky and Carol P. Einaudi, of Finnegan, Henderson, Farabow, Garrett & Dunner, Washington, District of Columbia. Of Counsel was Beryl L. Synder, of Biocraft Laboratories, Inc., Elmwood Park, New Jersey.

**JUDGES:**

Davis, Baldwin and Archer, Circuit Judges. Baldwin, Circuit Judge, dissenting.

**OPINIONBY:**

DAVIS

**OPINION:**

[\*1092] DAVIS, Circuit Judge.

This is an appeal from a final decision [\*\*2] of the United States Patent and Trademark Office (PTO) Board of Patent Appeals and Interferences (Board), sustaining the rejection of claims 1 through 3 in the reexamination application n1 of U.S. Patent No. 3,428,735 n2 (the '735 patent) as unpatentable under 35 U.S.C. § 103. We affirm.

n1 *Ex Parte Merck and Co.*, Reexamination No. 90/000264, Appeal No. 607-66 (PTO Bd. Pat. App. & Int., May 28, 1985), JA p. 7. In its opinion the Board expressly adopted the reasonings in its earlier reissue (for the '735 patent) opinions, *Ex Parte Edward L. Engelhardt*, Reissue Application No. 776,464, Appeal No. 424-40 (PTO Bd. Pat. App., Apr. 23, 1980), JA p. 13 and *Ex Parte Edward L. Engelhardt*, Reissue Application No. 776,464, Appeal No. 480-01 (PTO Bd. Pat. App., Feb. 25, 1982), JA p. 23.

n2 U.S. Patent No. 3,428,735, issued to Edward L. Engelhardt on February 18, 1969, was based on patent application Serial No. 662,907 filed August 24, 1967 as a continuation-in-part of patent application Serial No. 855,981 filed Nov. 30, 1959.

[\*\*3]

## I. BACKGROUND

### A. The Invention

The invention is directed to a method of treating human mental disorders; the method involves treating depression in humans by the oral administration of 5-(3-dimethylaminopropylidene)dibenzo[a, d][1, 4]cycloheptadiene (commonly known as and hereafter referred to as "amitriptyline"), or the hydrochloride or hydrobromide salts thereof, in a particular dosage range. Amitriptyline has the following chemical structure:

[SEE ILLUSTRATION IN ORIGINAL]

[\*1093] As representative of the invention, claim 1 reads:

1. A method of treating human mental disorders involving depression which comprises orally administering to a human affected by depression 5-(3-dimethylaminopropylidene) dibenzo[a, d] [1, 4]cycloheptadiene or its non-toxic salts in daily dosage of 25 to 250 mg. of said compound.

Remaining claims 2 and 3 are dependent from claim 1 and add limitations pertaining to the use of the hydrochloride and hydrobromide salts of amitriptyline, respectively.

### B. Related Proceedings

On March 10, 1977 an application, Serial No. 776,464 (the '464 application), was filed for reissue of the [\*4] '735 patent. n3 All the claims of the '464 application were finally rejected by the examiner under section 102 of title 35, United States Code, and alternatively under section 103 of that title. Subsequently, an appeal (Appeal No. 424-40) was taken to the Board n4 which affirmed the examiner's rejections. Additionally, the Board entered a new rejection under 35 U.S.C. § 103 over a combination of references not previously cited by the examiner. In accordance with 37 C.F.R. § 1.196(b) (1985) n5, appellant elected reconsideration of the '464 application by the examiner. The examiner maintained the rejection entered by the Board; in Appeal No. 480-01, the Board affirmed the examiner. The Board's decision was appealed to the Court of Customs and Patent Appeals (CCPA). Upon the motion of the Commissioner of Patents and Trademarks and on the authority of *In re Dien*, 680 F.2d 151, 214 U.S.P.Q. (BNA) 10 (CCPA 1982), the appeal was dismissed for lack of subject matter jurisdiction. n6

n3 The reissue application was filed as a "no defect" type reissue under the then existing 37 C.F.R. § 1.175(a)(4) (1980). That provision has now been repealed. [\*5]

n4 At that time, the Board of Patent Appeals and Interferences was called the Board of Patent Appeals.

n5 37 C.F.R. § 1.196(b) provides that when the Board of Appeals determines a new ground of rejection, the appellant may

- (1) after submitting appropriate amendments or showing of facts, have the matter reconsidered by the examiner;
- (2) waive reconsideration before the examiner and have the case reconsidered by the Board; or
- (3) treat the decision, including the new ground of rejection, as a final decision in the case.

n6 *See In the Matter of the Application of Edward L. Engelhardt*, Appeal No. 82-611 (CAFC Oct. 28, 1982) (order granting motion to dismiss).

The reissue application was protested by Biocraft Laboratories, Inc. (Biocraft), intervenor in the current appeal. Biocraft is also the plaintiff in a related litigation pending in the U.S. District Court for the District of New Jersey in which the validity and infringement of the '735 patent is in issue. *See Biocraft Laboratories Inc. v. Merck & Co.*, Civil Action No. 77-0693 (D.N.J.). The district [\*6] court has stayed further action in that case pending the final outcome of the pending PTO proceedings.

### C. Reexamination Proceeding

Following dismissal of the reissue appeal by the CCPA, Merck & Co., Inc. (Merck), the assignee of the '735 patent, filed for and was granted a request for reexamination of the patent. As a result of prosecution before the examiner, claims 1 through 3 of the reexamination application were finally rejected under 35 U.S.C. § 102 as anticipated by prior art references; the claims were also rejected under 35 U.S.C. § 103 as being obvious over references cited by the Board in its new ground of rejection entered during the initial reissue appeal. Finding the '735 patent to be entitled to the benefit

of the November 30, 1959 filing date of its parent application, Serial No. 855,981, the Board reversed the section 102 rejection because the effective filing date of the application antedated all the references cited therein. The Board, however, sustained the rejection for obviousness under section 103. Expressly adopting the reasonings of its earlier reissue opinions, the Board took the position [\*\*7] that in view of the prior art, in combination, [\*1094] and a thorough knowledge of the investigative techniques used in the medicinal chemical art, the skilled artisan would have expected the known tricyclic compound, amitriptyline, to be useful as an antidepressant.

#### D. The References

The references relied upon by the Board were:

- (1) Rey-Bellet et al. (Rey-Bellet) U.S. Patent No. 3,384,663, May 21, 1968 (application filed Mar. 27, 1959);
- (2) Kuhn, *Schweizerische Medizinische Wochenschrift*, Vol. 87, No. 35-36, pp. 1135-1140 (Aug. 1957);
- (3) Lehman et al. (Lehman), *Canadian Psychiatric Association Journal*, "The Treatment of Depressive Conditions with Imipramine (G 22355)", vol. 3, No. 4, pp. 155-164 (Oct. 1958);
- (4) Friedman, *First Symposium On Chemical Biological Correlation*, "Influence of Isosteric Replacements Upon Biological Activity", pp. 296-358 (May 1950);
- (5) Burger, *Journal of Chemical Education*, "Rational Approaches to Drug Structure", Vol. 33, No. 8, pp. 362-372 (Aug. 1956);
- (6) Petersen et al. (Petersen), *Arzneimittel-Forschung*, Vol. 8, No. 7, pp. 395-397 (1958);
- (7) Roche Research Report No. 43,162, pp. 1-9 (Nov. [\*\*8] 1957);
- (8) Roche Research Report No. 43,169, pp. 1-8 (Apr. 1958);
- (9) Roche Research Report No. 52,195, pp. 1-13 (Sept. 1958) (collectively called the "Roche Reports").

The Rey-Bellet patent disclosed amitriptyline and its hydrochloride salt. Properties of amitriptyline taught by the reference included a "manifold activity upon the central nervous system," as well as pharmacological and

medicinal properties, such as "narcosis-potentiating, adrenolytic, sedative, antihistaminic, antiemetic, antipyretic and hypothermic." Rey-Bellet did not disclose or otherwise teach that amitriptyline possessed antidepressive properties.

The Kuhn publication disclosed the compound, imipramine, and taught that the compound was a very effective antidepressant in humans. Imipramine has the chemical structure

[SEE ILLUSTRATION ON ORIGINAL]

and differs from the structure of amitriptyline only in the replacement of the unsaturated carbon atom in the center ring with a nitrogen atom. Kuhn taught a recommended dosage of 75-150 mg per day -- possibly 200-250 mg if the smaller doses proved ineffective.

The Lehman publication disclosed the results of a Canadian study of the effects [\*\*9] of imipramine on the symptoms of depression in humans. This article confirmed, for the most part, the teachings of the Kuhn article.

The object of the Friedman publication was "to survey the history of isosterism, to classify the varieties of isosteric replacements which are recorded in the literature, and to note the influence of these replacements on the biological activity of compounds." Friedman defined isosteres as atoms, ions or molecules in which the peripheral layers of electrons can be considered identical. Compounds which fit this broad definition and exhibit the same biological activity were termed "bioisosteric." Further, with respect to the medicinal chemists' use of the theory of "isosteric replacement" or "bio-isosteric replacement" as a tool to predict the properties of compounds, Friedman commented that:

to the synthetic organic chemist interested in medicinal chemistry, every physiologically active compound of known structure is a challenge -- a challenge either to better it, or perhaps merely to equal it. . . .

There are numerous ways of attacking such a problem. . . . One of the methods which has been used frequently, very [\*1095] often with success, [\*\*10] is that of isosteric replacement. The examples of this type of replacement in the literature are very numerous, and the fruitful results in the fields of sulfonamides, antimetabolites, and antihistamines are well known.

Friedman at page 296. Finally, Friedman disclosed various atoms or groups of atoms as bioisosteric, including the interchange of oxygen and the unsaturated carbon atom which often resulted in similar biological activity. Friedman, however, did not disclose or otherwise teach as bioisosteric the interchange of the nitrogen and unsaturated carbon atoms.

The Burger publication also discussed the theory of "bioisosterism" and its usefulness in designing new drugs based upon the knowledge of "lead" compounds.

The Petersen publication taught, *inter alia*, the properties of chlorpromazine (a phenothiazine derivative) and chlorprothixene (a 9-amino-alkylene-thioxanthene derivative), these compounds having the following structural formulas:

[SEE ILLUSTRATION ON ORIGINAL]

Petersen concluded that, when the nitrogen atom located in the central ring of the phenothiazine compound is interchanged with an unsaturated carbon atom as in the corresponding [\*\*11] 9-amino-alkylene-thioxanthene compound, the pharmacological properties of the thioxanthene derivatives resemble very strongly the properties of the corresponding phenothiazines. Using the theory of isosteric replacement, Petersen predicted this similarity in properties:

Structural chemical considerations permitted the expectation that the 9-amino-alkylene-thioxanthenes . . . would show great similarity to the corresponding phenothiazines. They should be more similar in their behavior to that of the phenothiazines than the saturated 9-amino-alkyl-thioxanthenes. From the physical point of view the ++-electron distributions (sites of ++-electrons) are almost the same in the phenothiazine derivatives and in the 9-aminoalkylene-thioxanthenes with their stabilizing conjugated double linkage between C9 in the thioxanthene ring and the first C-atom of the side chain.

Petersen at page 3. The compounds were disclosed as having a strong central depressive, i.e., tranquillizing, action in animals.

The Roche Reports revealed the results from tests comparing the pharmacological properties of amitriptyline and imipramine. The reports indicated that the two compounds were [\*\*12] very similar in a variety of properties, including their action as tranquilizers

having narcosis-potentiating effects. Because of this similarity and because amitriptyline and imipramine were structurally related, Roche scientists concluded that amitriptyline should be clinically tested for depression alleviation -- a known property of imipramine. In the pharmacological guideline for the clinical testings of amitriptyline (which was labelled Roche Preparation Ro 4-1575), the Roche Reports stated that

it is to be noted that a "tofranil-like effect" is already to be expected by using a dose 1/4 - 1/2 that of Tofranil. Side effects which can appear . . . are sedative and atropine-like effects, such as appear also with Tofranil. n7

n7 Tofranil is a tradename used for imipramine.

We must decide in this appeal whether appellant's invention would have been *prima facie* obvious over the available prior art of record; and, if so obvious, whether [\*\*1096] the *prima facie* case has been rebutted [\*\*13] by evidence of unexpected results.

## II. DISCUSSION

In its opinion on this problem, the Board expressly followed the guidelines of *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 U.S.P.Q. (BNA) 459, 466-67, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966), and made findings on factual inquiries specifically set forth in that decision. These factual findings must be accepted unless they are clearly erroneous. *In re Wilder*, 736 F.2d 1516, 1520, 222 U.S.P.Q. (BNA) 369, 372 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 1209, 105 S. Ct. 1173, 84 L. Ed. 2d 323 (1985); *In re De Blauwe*, 736 F.2d 699, 703, 222 U.S.P.Q. (BNA) 191, 193 (Fed. Cir. 1984); *accord Stock Pot Restaurant, Inc. v. Stockpot, Inc.*, 737 F.2d 1576, 1578-79, 222 U.S.P.Q. (BNA) 665, 666-67 (Fed. Cir. 1984). In this case we do not hold the Board's factual findings -- as to the scope and content of the prior art, the differences between the prior art and the claims at issue, and the level of ordinary skill in the art -- to be clearly erroneous and [\*\*14] accordingly we have followed them in our statement of the prior art and we now follow them in our analysis of the legal issue of obviousness.

*Prima Facie Obviousness:* The prior art taught that amitriptyline and imipramine are both psychotropic drugs which react on the central nervous system and which were known in the art prior to the time of appellant's invention. Imipramine was known to possess antidepressive properties in humans. While amitriptyline was known to

possess psychotropic properties such as sedative and narcosis-potentiating properties, the drug was not known to be an antidepressant. However, the prior art has shown that imipramine and amitriptyline are unquestionably closely related in structure. Both compounds are tricyclic dibenzo compounds and differ structurally only in that the nitrogen atom located in the central ring of imipramine is interchanged with an unsaturated carbon atom in the central ring of amitriptyline. To show obviousness, it was necessary to determine from knowledge already available in the art at the time of appellant's invention that one skilled in the medicinal chemical art would have expected amitriptyline, like imipramine, to be useful [\*\*15] in the treatment of depression in humans. *In re Papesch*, 50 C.C.P.A. 1084, 315 F.2d 381, 137 U.S.P.Q. (BNA) 43 (CCPA 1963).

As found by the Board, the Roche Reports recognized the structural relationship between amitriptyline and imipramine and concluded that amitriptyline should be tested for its anti-depressant activities. In fact, the Roche Reports expressly stated that amitriptyline was expected to resemble imipramine clinically in its depression alleviation effects.

"Structural similarity, alone, may be sufficient to give rise to an expectation that compounds similar in structure will have similar properties." *In re Payne*, 606 F.2d 303, 313, 203 U.S.P.Q. (BNA) 245, 254 (CCPA 1979). However, the Board did not rest its conclusion of obviousness on structural similarity alone. Rather, the Board further recognized that in attempting to predict the biological activities of a drug, a skilled medicinal chemist would not proceed randomly, but would base his attempts on the available knowledge of prior research techniques, and literature used in his field. [\*\*16] The prior art showed that one such technique was "bioisosteric replacement" or the theory of bioisosterism -- where the substitution of one atom or group of atoms for another atom or group of atoms having similar size, shape and electron density provides molecules having the same type of biological activity. Finding that the Friedman, Burger and Petersen references taught that bioisosterism was commonly used by medicinal chemists prior to 1959 in an effort to design and predict drug activity, the Board concluded that one of ordinary skill in the arts would have been aware of this technique at the time of appellant's invention. n8 Further, the Board [\*1097] found that Petersen taught as bioisosteric the interchange of the nitrogen and unsaturated carbon atoms -- the precise structural difference between imipramine and amitriptyline. n9

n8 Appellant submitted the declaration of Dr. Paul N. Craig, an experienced medicinal chemist,

JA p. 372. His view was that the concept of bioisosterism could not be used in 1959 to predict the antidepressant effects in amitriptyline or the pharmacological differences between imipramine and amitriptyline. Dr. Craig stated:

In my opinion "isosterism" in 1959 afforded no basis for predicting the specific pharmaceutical utility in humans, and it is my belief that that is still true today. . . . I do not believe the carryover of tranquilizing activity from chlorpromazine to chlorprothixene afforded a reasonable basis for predicting the carryover of antidepressant properties from imipramine to amitriptyline.

Affidavit of Paul N. Craig, JA, pp. 374-75.

Plainly the Board was not clearly erroneous in discounting that testimony. There was independent evidence in the record to the contrary. The Friedman, Burger and Petersen references recognize that concept as a means of predicting biological properties in isosterically-related compounds prior to 1959. [\*\*17]

n9 Petersen even went so far as to suggest that the apparent bioisosteric relationship between the interchange of the nitrogen and unsaturated carbon atoms led to the design of chlorprothixene in the expectation that the compound would share the same biological activity as chlorpromazine. See Petersen, *supra*, at p. 395.

We see no clear error in the Board's determination as to the teachings of the prior art references, in combination. In view of these teachings, which show a close structural similarity and a similar use (psychotropic drugs) between amitriptyline and imipramine, one of ordinary skill in the medicinal chemical arts, possessed of the knowledge of the investigative techniques used in the field of drug design and pharmacological predictability, would have expected amitriptyline to resemble imipramine in the alleviation of depression in humans. Accordingly, we agree with the Board that appellant's invention was *prima facie* obvious over the prior art of record.

In traversing the Board's decision of obviousness, appellant has urged that the Board's decision was premised [\*\*18] on an impermissible "obvious to try"

800 F.2d 1091, \*, 1986 U.S. App. LEXIS 20333, \*\*;  
231 U.S.P.Q. (BNA) 375

standard. Appellant contends that there was no motivation in the prior art to arrive at appellant's invention. "Obvious to try is not the standard of 35 U.S.C. § 103." *In re Antonie*, 559 F.2d 618, 620, 195 U.S.P.Q. (BNA) 6, 8 (CCPA 1977) (emphasis omitted). Rather, the test is whether the references, taken as a whole, would have suggested appellant's invention to one of ordinary skill in the medicinal chemical arts at the time the invention was made. *In re Simon*, 59 C.C.P.A. 1140, 461 F.2d 1387, 1390, 174 U.S.P.Q. (BNA) 114, 116 (CCPA 1972). Clearly, amitriptyline and imipramine, both known psychotropic drugs, are closely structurally related. The expectation that the similar structures would behave similarly was suggested in the Roche Reports. In combination with those teachings, the prior art teaching that the precise structural difference between amitriptyline and imipramine involves a known bioisosteric replacement provides sufficient basis for the required expectation of success, without [\*\*19] resort to hindsight. n10 Obviousness does not require absolute predictability. *In re Lamberti*, 545 F.2d 747, 750, 192 U.S.P.Q. (BNA) 278, 280 (CCPA 1976). Only a reasonable expectation that the beneficial result will be achieved is necessary to show obviousness. *In re Longi*, 759 F.2d 887, 897, 225 U.S.P.Q. (BNA) 645, 651 (Fed. Cir., 1985).

n10 The teachings of the Roche Reports as well as the Petersen reference distinguish this case from *In re Grabiak*, 769 F.2d 729, 731, 226 U.S.P.Q. (BNA) 870, 871 (Fed. Cir. 1985) ("there is no motive in the cited art to make the modification required to arrive at appellants' compounds").

We also find untenable appellant's arguments that Petersen teaches away from appellant's invention. Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of [\*\*20] references. *In re Keller*, 642 F.2d 413, 425, 208 U.S.P.Q. (BNA) 871, 881 (CCPA 1981). Thus, Petersen must be read, not in isolation, but for what it fairly teaches in combination with the prior art as a whole. That teaching is that the interchange of the nitrogen and the unsaturated carbon atoms is isosteric and compounds so modified are [\*\*1098] expected to possess similar biological properties.

Neither are we persuaded by appellant's contention that the Board erred in relying on the contemporaneous independent invention of others to support its holding of obviousness. n11 As we have said earlier, the teachings of the prior art references in combination adequately support the Board's conclusion. However, the additional,

although unnecessary, evidence of contemporaneous invention is probative of "the level of knowledge in the art at the time the invention was made." *In re Farrenkopf*, 713 F.2d 714, 720, 219 U.S.P.Q. (BNA) 1, 6 (Fed. Cir. 1983).

N11 *Ex Parte Edward L. Engelhardt*, Appeal No. 424-40, *supra* note 1, at pp. 23-24, JA pp. 22(1)-22(m), where the Board indicated that evidence before it revealed that four other groups of inventors independently and contemporaneously discovered amitriptyline's antidepressant properties using reasoning based on a thorough knowledge of investigative techniques, which included the concept of isosterism, used in the medicinal art area.

[\*\*21]

*Unexpected Results*: A prima facie case of obviousness can be rebutted by evidence of unexpected results. *In re Davies*, 475 F.2d 667, 670, 177 U.S.P.Q. (BNA) 381, 384 (CCPA 1973). In rebuttal of the PTO's prima facie case appellant has asserted that, as compared to imipramine, amitriptyline unexpectedly has a more potent sedative and a stronger anticholinergic effect. In support of this contention, appellant had relied on an affidavit of Dr. Joseph J. Schildkraut, n12 a psychiatrist and a Professor of Psychiatry at Harvard, and also on a published record of a symposium of physicians and psychiatrists concerned with the treatment of the depressed patient. n13

n12 Affidavit of Joseph J. Schildkraut, JA p. 366.

n13 Symposium, *Depression Today -- Experts Answer Your Questions*, JA p. 309.

Dr. Schildkraut's affidavit recognizes some pharmacological differences between amitriptyline and imipramine [\*\*22] including the fact that amitriptyline is a more potent sedative and has a stronger anticholinergic effect than imipramine. Further, Dr. Schildkraut notes that depressed patients have responded differently to amitriptyline and imipramine, some responding to one and not the other or more favorably to one than to the other. For the most part, the record of the cited symposium confirms the differences noted in the Schildkraut affidavit. n14 That record also counseled practicing physicians on choosing from the spectrum of tricyclic antidepressants (a term which includes amitriptyline and imipramine) the particular drug useful for an individual patient.

n14 Dr. Schildkraut was a member of the symposium.

After a careful consideration of all the evidence, we are persuaded that the Board did not err in determining that the alleged unexpected properties of amitriptyline are not so unexpectedly different from the properties of imipramine, the closest prior art, as to overcome the prima facie showing of obviousness. The [\*\*23] prior art of record clearly taught that amitriptyline was a known sedative. n15 The evidence before us (which was, of course, before the Board) further revealed that all tricyclic antidepressant drugs, in general, possess the secondary properties of sedative and anticholinergic effects. Specifically, the record showed that during the prosecution of the reissue application, appellant submitted an article entitled "Using the tricyclic antidepressants" which included a table comparing the properties of known tricyclic antidepressant drugs. n16 Included in these properties were sedative and anticholinergic effects of the known antidepressants. n17 [\*1099] Thus, it appears that the alleged difference in properties between amitriptyline and imipramine is a matter of degree rather than kind. Moreover, as to the sedative effects, the article revealed only a slight difference between the two compounds. Amitriptyline was characterized as "highly sedative" while imipramine was only "somewhat less [sedative] than amitriptyline." n18 Regarding the anticholinergic effect, the article showed that both drugs have anticholinergic effects but to a different degree. These are not truly unexpected [\*\*24] results. The Board found in one of its reissue opinions (incorporated in the reexamination decision now on appeal): "in regard to the sedative and anticholinergic properties of amitriptyline, we are not convinced that the side effects of this material [amitriptyline] are significantly or unexpectedly different from the level of those properties exerted by the closest prior art antidepressant, imipramine." n19

n15 Rey-Bellet, *supra*, col. 2, line 16.

n16 *Patient Care*, "Using the Tricyclic Antidepressants," pp. 28-33, 35-36, 39-40, 43-45, 49-52, 57-58, 63-64, 67-68, 71, 73-76, 78, 81, 84-85 (May 15, 1979); *see also* Commission's Appendix, pp. CA 17-45.

n17 *See also* the Symposium, *Depression Today -- Experts Answer Your Questions*, *supra* note 13, at p. 315, where Dr. Hollister indicates that when choosing from the spectrum of tricyclic antidepressant drugs, the choice is based on three pharmacological actions including (1) the amount

of sedation (2) the amount of anticholinergic effect and (3) the nature of the drugs in primarily blocking the uptake of serotonin or norepinephrine. [\*\*25]

n18 *Patient Care*, "Using the Tricyclic Antidepressants," *supra* note 16, at p. 50.

n19 *Ex Parte Edward L. Engelhardt*, Appeal No. 480-01, *supra* note 1, at p. 12, JA p. 34.

The core of it is that, while there are some differences in degree between the properties of amitriptyline and imipramine, the compounds expectedly have the same type of biological activity. In the absence of evidence to show that the properties of the compounds differed in such an appreciable degree that the difference was really unexpected, we do not think that the Board erred in its determination that appellant's evidence was insufficient to rebut the prima facie case. The fact that amitriptyline and imipramine, respectively, helped some patients and not others does not appear significant. As noted by the Board, a difference in structure, although slight, would have been expected to produce some difference in activity.

In sum, we hold that the claimed invention would have been obvious to one of ordinary skill in the art. Accordingly, the decision of the Board is

AFFIRMED.

DISSENTBY:

BALDWIN

DISSENT: [\*\*26]

BALDWIN, Circuit Judge, dissenting.

The rejection by the board is flawed because it did not analyze the invention according to the requirement of 35 U.S.C. § 103. The board wrote:

The issue before us in considering the instant claims on their merits for patentability is whether the artisan having the requisite skill in the pertinent art area and a knowledge of the available prior art would have been motivated to employ amitriptyline in the treatment of human depression.

That is, whether it would have been obvious to try amitriptyline as an antidepressant. Guided by the

disclosure of the applicant, the board pieced together information from various patents, journal articles, and papers, and concluded:

It remains our position that one having ordinary skill in this art are[sic] would have been familiar with the concept of bioisosterism and because of this knowledge would have concluded that the known compound, i.e., amitriptyline, would be *potentially* useful as an antidepressant. [Emphasis ours.]

That is, it would have been obvious to try amitriptyline as an antidepressant. Obvious-to-try is not the test for patentability [\*\*27] under 35 U.S.C. § 103. This court and its predecessor, the CCPA, have repeatedly rejected that approach. *In re Goodwin*, 576 F.2d 375, 377, 198 U.S.P.Q. (BNA) 1, 3 (CCPA 1978); *In re Antonie*, 559 F.2d 618, 620, 195 U.S.P.Q. (BNA) 6, 8 (CCPA 1977); *In re Lindell*, 55 C.C.P.A. 707, 385 F.2d 453, 455, 155 U.S.P.Q. (BNA) 521, 523 (CCPA 1967); *In re Tomlinson*, 53 C.C.P.A. 1421, 363 F.2d 928, 150 U.S.P.Q. (BNA) 623 (CCPA 1966); *In re Papesch*, 50 C.C.P.A. 1084, 315 F.2d 381, 137 U.S.P.Q. (BNA) 43 (CCPA 1963); *see also In re Grabiak*, 769 F.2d 729, 226 U.S.P.Q. (BNA) 870 (Fed. Cir. 1985).

Congress has also rejected that approach by enacting the second sentence of 35 U.S.C. § 103, which states "patentability shall not be negated by the manner in [\*\*1100] which the invention was made." The reviser's note on this sentence states "it is immaterial whether it resulted from long toil and experimentation or from a flash of genius."

The obvious-to-try analysis is an attack on the method of making an invention that specifically penalizes [\*\*28] people in areas of endeavor where advances are won only by great effort and expense. The pharmaceutical field is particularly hard hit because there is an overabundance of structures that are obvious to try. Consider, for example, the Petersen reference which the majority cites to demonstrate the possibility that a nitrogen atom may be replaced by a double-bonded carbon atom. This journal article records an attempt to find drugs useful for the treatment of endogenous psychoses, i.e., tranquilizers. The researchers tested eighteen chemicals with closely related structures. These materials were injected into mice, and compared for their ability to make the mice fall asleep. The results of these tests may be tantalizing and useful, but only as a guide for further research. I agree that, based on this information and the other references cited by the board, the researcher with ordinary skill in the art would be motivated to investigate the possibility of substituting a double-bonded

carbon atom for nitrogen. The researcher would also be motivated to test every other structural variation in Petersen, as well as a host of others. Under an obvious-to-try analysis, any of these structures [\*\*29] which ultimately is shown to be effective as an antidepressant in human beings would be unpatentable because the researcher dared to follow a logical plan.

The board and the majority also err by reading too much certainty into the teachings of the references. They have not considered the references as a whole. Friedman discusses the phenomenon that compounds with similar chemical structures sometimes behave in a similar fashion in a biological system. Once such a compound has been tested and found to have the same biological activity, it is called "bio-isosteric." n1

n1 The term "bio-isosteric" therefore is simply a conclusion drawn after testing. The label is properly limited to the system and purpose for which the compounds were tested. For example, two drugs could be bio-isosteric with respect to making mice fall asleep, and not bio-isosteric when tested at a particular dosage level for the treatment of high blood pressure in human beings. The theory of bio-isosterism as used by the board and majority is nothing more or less than an analysis of structural obviousness.

[\*\*30]

Friedman also teaches that an isosteric compound "may have the same activity as the original, or *more usually* it may have an *antagonistic* effect." (Emphasis added.) Friedman explains that in order to predict biological activity with accuracy, one ideally should know (1) the mechanism by which the original drug acts and (2) what part of the structure of the original drug is critical to the original drug activity. n2 That reference also unequivocally states that comparisons should be made in living systems, but such information is not easily available. That reference relies on *in vitro* testing, and it specifically states that *in vitro* results may or may not correlate with clinical studies. It also clearly states that, for the purposes of its discussion, biological activities such as absorption, distribution, conjugation (detoxification), taste, odor and *side effects of drugs* will be ignored. Friedman concludes that compounds with similar structures need not be bio-isosteric.

n2 Neither this reference nor any of the others purport to disclose either piece of information.

[\*\*31]



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The Burger reference does discuss bio-isosterism and its usefulness in designing new drugs. Its evaluation of bio-isosterism as a tool for predicting drug activity is as follows:

However, if one can achieve a gradual change of biological behavior and follow it accurately at each step of minor structural alteration, one is bound to enhance one property, suppress another, and ultimately arrive at a drug suitable for therapy. Shortcuts to this disconcertingly tedious process have not been found, and this is probably responsible for the still [\*1101] prevailing opinion that new useful drugs will be discovered most easily by more or less empirical procedures.

at page 369, and

Slight stereochemical or structural changes may alter considerably the biological role

of a compound. Patient variation of at least a reasonable number of structures is still the only answer to this question.

at page 370.

The Roche reports contain background information about various pharmacological effects of amitriptyline. The information was derived from testing for its toxicity and tranquilizing effect on animals. This information would be essential to a decision [\*\*32] to clinically test the drug. It is not sufficient to show the drug would be useful for treating human beings. Congress gave pragmatic recognition to the difficulty of determining whether a new drug is useful by its enactment of the 1962 amendment to 21 U.S.C. § 321. That action was taken in response to problems caused by another tranquilizer, thalidomide.

Neither these references, nor the other references cited by the board and the majority purport to teach the worker with ordinary skill in the art that amitriptyline is a drug that is useful for treating depression in human beings. That conclusion is steps removed from the information presented by these sources. I would reverse.

LEXSEE 837 F.2D 1071

In re David H. Fine

No. 87-1319

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

837 F.2d 1071; 1988 U.S. App. LEXIS 686; 5 U.S.P.Q.2D (BNA) 1596

January 26, 1988, Decided

**PRIOR HISTORY:** [\*\*1]

Appealed from: Board of Patent Appeals and Interferences of the United States Patent and Trademark Office.

**LexisNexis(R) Headnotes**

**COUNSEL:**

Morris Relson, Darby & Darby, P.C., argued for Appellant. With him on the brief was Beverly B. Goodwin.

Lee E. Barrett, Associate Solicitor, Office of the Solicitor, argued for Appellee. With him on the brief were Joseph F. Nakamura, Solicitor and Fred E. McKelvey, Deputy Solicitor.

**JUDGES:**

Friedman, Smith, and Mayer, Circuit Judges. Smith, Circuit Judge, dissenting.

**OPINIONBY:**

MAYER

**OPINION:**

[\*1072] MAYER, Circuit Judge.

David H. Fine appeals from a decision of the Board of Patent Appeals and Interferences of the United States Patent and Trademark Office (Board) affirming the rejection of certain claims of his application, Serial No. 512,374, and concluding that his invention would have been obvious to one of ordinary skill in the art and was

therefore unpatentable under 35 U.S.C. § 103. We reverse.

**Background**

**A. The Invention.**

The invention claimed is a system for detecting and measuring minute quantities of nitrogen compounds. According to Fine, the system has the ability to detect the presence of nitrogen compounds in quantities [\*\*2] as minute as one part in one billion, and is an effective means to detect drugs and explosives, which emanate nitrogen compound vapors even when they are concealed in luggage and closed containers.

The claimed invention has three major components: (1) a gas chromatograph which separates a gaseous sample into its constituent parts; (2) a converter which converts the nitrogen compound effluent output of the chromatograph into nitric oxide in a hot, oxygen-rich environment; and (3) a detector for measuring the level of nitric oxide. The claimed invention's sensitivity is achieved by combining nitric oxide with ozone to produce nitrogen dioxide which concurrently causes a detectable luminescence. The luminescence, which is measured by a visual detector, shows the level of nitric oxide which in turn is a measure of nitrogen compounds found in the sample.

The appealed claims were rejected by the Patent and Trademark Office (PTO) under 35 U.S.C. § 103. Claims 60, 63, 77 and 80 were rejected as unpatentable over Eads, Patent No. 3,650,696 (Eads) in view of Warnick, et al., Patent No. 3,746,513 (Warnick). Claims 62, 68, 69, 79, 85 and 86 were rejected as unpatentable [\*\*3] over Eads and Warnick in view of Glass, et al., Patent No. 3,207,585 (Glass).

**B. The Prior Art.**

### 1. Eads Patent.

Eads discloses a method for separating, identifying and quantitatively monitoring [\*1073] sulfur compounds. The Eads system is used primarily in "air pollution control work in the scientific characterization of odors from sulfur compounds."

The problem addressed by Eads is the tendency of sulfur compounds "to adhere to or react with the surface materials of the sampling and analytical equipment, and/or react with the liquid or gaseous materials in the equipment." Because of this, the accuracy of measurement is impaired. To solve the problem, the Eads system collects an air sample containing sulfur compounds in a sulfur-free methanol solution. The liquid is inserted into a gas chromatograph which separates the various sulfur compounds. The compounds are next sent through a pyrolysis furnace where they are oxidized to form sulfur dioxide. Finally, the sulfur dioxide passes through a measuring device called a microcoulometer which uses titration cells to calculate the concentration of sulfur compounds in the sample.

### 2. Warnick Patent.

Warnick [\*\*4] is directed to a means for detecting the quantity of pollutants in the atmosphere. By measuring the chemiluminescence of the reaction between nitric oxide and ozone, the Warnick device can detect the concentration of nitric oxide in a sample gaseous mixture.

Warnick calls for "continuously flowing" a sample gaseous mixture and a reactant containing ozone into a reaction chamber. The chemiluminescence from the resulting reaction is transmitted through a light-transmitting element to produce continuous readouts of the total amount of nitric oxide present in the sample.

### 3. Glass Patent.

The invention disclosed in Glass is a device for "completely burning a measured amount of a substance and analyzing the combustion products." A fixed amount of a liquid petroleum sample and oxygen are supplied to a flame. The flame is then spark-ignited, causing the sample to burn. The resulting combustion products are then collected and measured, and from this measurement the hydrogen concentration in the sample is computed.

### C. The Rejection.

The Examiner rejected claims 60, 63, 77 and 80 because "substitution of the [nitric oxide] detector of Warnick for the sulfur detector of Eads [\*\*5] would be an obvious consideration if interested in nitrogen compounds, and would yield the claimed invention." He further asserted that "Eads teaches the [claimed] combination of

chromatograph, combustion, and detection, in that order. . . . Substitution of detectors to measure any component of interest is well within the skill of the art." In rejecting claims 62, 68, 69, 79, 85 and 86, the Examiner said, "Glass et al. teach a flame conversion means followed by a detector, and substitution of the flame conversion means of Glass et al. for the furnace of Eads would be an obvious equivalent and would yield the claimed invention." The Board affirmed the Examiner's rejection.

### Discussion

#### A. Standard of Review.

Obviousness under 35 U.S.C. § 103 is "a legal conclusion based on factual evidence." *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1535, 218 USPQ 871, 876 (Fed. Cir. 1983) (quoting *Stevenson v. Int'l Trade Comm'n*, 612 F.2d 546, 549, 204 USPQ 276, 279, 67 C.C.P.A. 109 (CCPA 1979)). Therefore, an obviousness determination [\*\*6] is not reviewed under the clearly erroneous standard applicable to fact findings, *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 956, 220 USPQ 592, 596 (Fed. Cir. 1983); it is "reviewed for correctness or error as a matter of law." *In re De Blauwe*, 736 F.2d 699, 703, 222 USPQ 191, 195 (Fed. Cir. 1984).

To reach a proper conclusion under § 103, the decisionmaker must step backward in time and into the shoes worn by [a person having ordinary skill in the art] when the invention was unknown and just before it was made. In light of *all* the evidence, the decisionmaker must then determine whether . . . the claimed invention as a whole would have been [\*1074] obvious at *that* time to *that* person. 35 U.S.C. § 103. The answer to that question partakes more of the nature of law than of fact, for it is an ultimate conclusion based on a foundation formed of all the probative facts.

*Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1566, 1 USPQ2d 1593, 1595-96 (Fed. Cir. 1987).

#### B. Prima [\*\*7] Facie Obviousness.

Fine says the PTO has not established a *prima facie* case of obviousness. He contends the references applied by the Board and Examiner were improperly combined, using hindsight reconstruction, without evidence to

support the combination and in the face of contrary teachings in the prior art. He argues that the appealed claims were rejected because the PTO thought it would have been "obvious to try" the claimed invention, an unacceptable basis for rejection.

We agree. The PTO has the burden under section 103 to establish a *prima facie* case of obviousness. See *In re Piasecki*, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-87 (Fed. Cir. 1984). It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. *In re Lalu*, 747 F.2d 703, 705, 223 USPQ 1257, 1258 (Fed. Cir. 1984); see also *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 297 n. 24, 227 USPQ 657, 667 n.24 (Fed. Cir. 1985); [\*8] *ACS Hosp. Sys., Inc. v. Montefiore Hosp.*, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). This it has not done. The Board points to nothing in the cited references, either alone or in combination, suggesting or teaching Fine's invention.

The primary basis for the Board's affirmance of the Examiner's rejection was that it would have been obvious to substitute the Warnick nitric oxide detector for the Eads sulfur dioxide detector in the Eads system. The Board reiterated the Examiner's bald assertion that "substitution of one type of detector for another in the system of Eads would have been within the skill of the art," but neither of them offered any support for or explanation of this conclusion.

Eads is limited to the analysis of sulfur compounds. The particular problem addressed there is the difficulty of obtaining precise measurements of sulfur compounds because of the tendency of sulfur dioxide to adhere to or react with the sampling analytic equipment or the liquid or gaseous materials in the equipment. It solves this problem by suggesting that the gaseous sample containing sulfur compounds be absorbed into sulfur-free methanol and then inserted into [\*9] a gas chromatograph to separate the sulfur compounds.

There is no suggestion in Eads, which focuses on the unique difficulties inherent in the measurement of sulfur, to use that arrangement to detect nitrogen compounds. In fact, Eads says that the presence of nitrogen is undesirable because the concentration of the titration cell components in the sulfur detector is adversely affected by substantial amounts of nitrogen compounds in the sample. So, instead of suggesting that the system be used to detect nitrogen compounds, Eads deliberately seeks to avoid them; it warns against rather than teaches Fine's invention. See *W. L. Gore & Assoc. v. Garlock, Inc.*, 721 F.2d 1540, 1550, 220 USPQ 303, 311 (Fed. Cir. 1983) (error to find obviousness where references "diverge from and teach

away from the invention at hand"). In the face of this, one skilled in the art would not be expected to combine a nitrogen-related detector with the Eads system. Accordingly, there is no suggestion to combine Eads and Warnick.

Likewise, the teachings of Warnick are inconsistent with the claimed invention, to some extent. The Warnick claims are directed to a gas stream from engine exhaust [\*10] "continuously flowing the gaseous mixtures into the reaction chamber" to obtain "continuous readouts" of the amount of nitric oxide in the sample. In other words, it contemplates measuring the total amount of nitric oxide in a continuously flowing gaseous mixture of unseparated nitrogen constituents. By contrast, in Fine each [\*1075] nitrogen compound constituent of the gaseous sample is retained in the chromatograph for an individual time period so that each exits in discrete, time-separated pulses. \* By this process, each constituent may be both identified by its position in time sequence, and measured. The claimed system, therefore, diverges from Warnick and teaches advantages not appreciated or contemplated by it.

\* The Solicitor argues that the contents of Attachment C of Fine's brief were not before the Board and may not properly be considered here. However, we need not rely on Attachment C. It is merely illustrative of the qualitative separation of nitrogen compounds which occurs in Fine's system. The fact that the various constituents exit at discrete intervals is shown by the specification which was before the Board and which may appropriately be considered on appeal. See, e.g., *Astra-Sjuco, A.B. v. United States Int'l Trade Comm'n*, 67 C.C.P.A. 128, 629 F.2d 682, 686, 207 USPQ 1, 5 (CCPA 1980) (claims must be construed in light of specification).

[\*11]

Because neither Warnick nor Eads, alone or in combination, suggests the claimed invention, the Board erred in affirming the Examiner's conclusion that it would have been obvious to substitute the Warnick nitric oxide detector for the Eads sulfur dioxide detector in the Eads system. *ACS Hosp. Sys.*, 732 F.2d at 1575-77, 221 USPQ at 931-33. The Eads and Warnick references disclose, at most, that one skilled in the art might find it obvious to try the claimed invention. But whether a particular combination might be "obvious to try" is not a legitimate test of patentability. *In re Geiger*, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987); *In re Goodwin*, 576 F.2d 375, 377, 198 USPQ 1, 3 (CCPA 1978).

Obviousness is tested by "what the combined teachings of the references would have suggested to those

of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). But it "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching [\*\*12] or suggestion supporting the combination." *ACS Hosp. Sys.*, 732 F.2d at 1577, 221 USPQ at 933. And "teachings of references can be combined *only* if there is some suggestion or incentive to do so." *Id.* Here, the prior art contains none.

Instead, the Examiner relies on hindsight in reaching his obviousness determination. But this court has said, "To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." *W.L. Gore*, 721 F.2d at 1553, 220 USPQ at 312-13. It is essential that "the decisionmaker forget what he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made . . . to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art." *Id.* One cannot use [\*\*13] hindsight reconstruction to pick and choose among isolated disclosures in the prior art to depreciate the claimed invention.

#### C. Advantage Not Appreciated by the Prior Art.

The Board erred not only in improperly combining the Eads and Warnick references but also in failing to appreciate that the appealed claims can be distinguished over that combination. A material limitation of the claimed system is that the conversion to nitric oxide occur in the range of 600 degrees C to 1700 degrees C. The purpose of this limitation is to prevent nitrogen from other sources, such as the air, from being converted to nitric oxide and thereby distorting the measurement of nitric oxide derived from the nitrogen compounds of the sample.

The claimed nitric oxide conversion temperature is not disclosed in Warnick. Although Eads describes a preferred temperature of 675 degrees C to 725 degrees C, the purpose of this range is different from that of Fine. Eads requires the 675 degrees C to 725 degrees C range because it affords a temperature low enough to avoid formation of unwanted sulfur trioxide, yet high enough to avoid formation of unwanted sulfides. Fine's temperature [\*1076] range, in contrast, [\*\*14] does not seek to avoid the formation of sulfur compounds or even nitrogen compounds. It enables the system to break down the nitrogen compounds of the sample while avoiding the destruction of background nitrogen gas. There is a partial

overlap, of course, but this is mere happenstance. Because the purposes of the two temperature ranges are entirely unrelated, Eads does not teach use of the claimed range. See *In re Geiger*, 815 F.2d at 688, 2 USPQ2d at 1278. The Board erred by concluding otherwise.

#### D. Unexpected Results.

Because we reverse for failure to establish a *prima facie* case of obviousness, we need not reach Fine's contention that the Board failed to accord proper weight to the objective evidence of unexpected superior results. *Id.*

#### E. The "Flame" Claims.

Claims 62, 68, 69, 79, 85 and 86 relate to the oxygen-rich flame conversion means of the claimed invention. These "flame" claims depend from either apparatus claim 60 or method claim 77. Dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious. [\*\*15] *Hartness Int'l, Inc. v. Simplimatic Eng'g Co.*, 819 F.2d 1100, 1108, 2 USPQ2d 1826, 1831 (Fed. Cir. 1987); *In re Abele*, 684 F.2d 902, 910, 214 USPQ 682, 689 (CCPA 1982); see also *In re Sernaker*, 702 F.2d 989, 991, 217 USPQ 1, 3 (Fed. Cir. 1983). In view of our conclusion that claims 60 and 77 are nonobvious, the dependent "flame" claims are also patentable.

#### Conclusion

The Board's decision affirming the Examiner's rejection of claims 60, 62, 63, 68, 69, 77, 79, 80, 85 and 86 of Fine's application as unpatentable over the prior art under 35 U.S.C. § 103 is

REVERSED.

#### DISSENTBY:

SMITH

#### DISSENT:

SMITH, Circuit Judge, dissenting.

I respectfully dissent. I am of the firm belief that the prior art references, relied upon by the PTO to establish its *prima facie* case of obviousness, in combination teach and suggest Fine's invention to one skilled in the art. Also, I firmly believe that Fine failed to rebut the PTO's *prima facie* case. On this basis, I would affirm the board's determination sustaining the examiner's rejection, pursuant to 35 U.S.C. § 103, of Fine's claims on appeal before [\*\*16] this court.